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ORIGINAL ARTICLE

Hospital acquired diarrhea in a burn center of Tehran

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ABSTRACT

Background and Objectives: Incidence of hospital-acquired diarrhea has increased rapidly and burn patients are at high risk of getting it. Infection with *C. difficile* is the most common cause of antibiotic associated diarrhea. The aim of this study was to determine the baseline characteristics and clinical presentation of hospital-acquired diarrhea and compare *C. difficile* and non-*C. difficile* diarrhea in burn patients treated at a burn center.

Materials and Methods: During a 1-year study all patients with hospital-acquired diarrhea at Motahari Burn Hospital, Tehran, Iran enrolled in this study. We compared patients with a stool sample positive for *C. difficile* toxin or tracing the antigen in patients who were negative for detection of toxin in their stool sample specimens.

Results: Diarrhea developed in 37 patients out of 3200 admitted patients with a mean burn size of 34.8 ±20.1%. Among them, 8 patients had a positive result for *C. difficile*. The mean time between antibiotic therapy and occurrence of diarrhea was 9.5 ± 6.2 days. Nine (23.7%) patients died in the 7.8± 4.2 days, mostly due to co-morbidities. The mean duration of diarrhea was 3.6 ± 2 days. Twenty two (57.9%) patients were treated with oral metronidazol and eleven (28.9%) patients were treated with combination of metronidazole and vancomycin, higher rate of combination therapy was seen in *Clostridium difficile* CDI.

Conclusion: Overall, the prevalence of hospital-acquired diarrhea was 120/10,000 and 21% of them caused by infection with *C. difficile.* Presence of peripheral leukocytosis and colitis were the alarm sign for diagnosis of *C. difficile* infection.

Keywords: Hospital-acquired diarrhea (HAD), Burn, *Clostridium difficile* infection (CDI)

INTRODUCTION

Incidence of hospital-acquired diarrhea (HAD) has increased rapidly. Overall rates of HAD range from 2.3 to 4.1 illnesses per 100 admissions on pediatric wards and from 7.7 per 100 admissions to 41% of adults hospitalized in intensive care units (1) and 2–32% of admitted patients in general medicine wards (2). There are many causes of HAD, including medications, nasogastric tube feeding, bowel ischemia, or constipation causing pseudodiarrhea (3, 4). Other risk factors are age, length of hospitalization, nutritional status, immune status, and exposure to gastrointestinal procedures such as nasogastric intubation and endoscopy (2). Prolonged use of broad spectrum antibiotics, which disrupt normal colonic flora followed by colonization of *Clostridium difficile*, is the most common cause of HAD. Patients may acquire pathogens during contact with other patients, healthcare workers, or contaminated hospi-

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tal surface (1, 2). Crowded hospital wards, increased use of broad-spectrum antibiotics, and relatively poor infection control, stomach acid–inhibiting agents such as proton-pump inhibitors and histamine type 2 antagonists, prior hospitalization, severity of underlying illness, fuoroquinolones, older than 65 years have been associated with increased risk for CDI (3, 5, 6).

Burn patients are at high risk for infectious complication such as HAD due to alterations in their skin and mucosal barriers, general altered physiology in response to the stress of injury, and increased incidence of established risk factors of HAD (5). Besides HAD may cause additional medical complications for severely ill patients and pose an increased risk of mortality (2). Considering that the early diagnosis of HAD and urgent appropriate treatment are clinically crucial, the aim of this study was to determine the baseline characteristics and clinical presentation of HAD and compare *C. difficile* and non-*C. difficile* diarrhea in burn patients treated at a burn center.

METHODS

During a 1-year prospective cross-sectional study (1/Jun/2013-1/Jun/2014), all patients with HAD (at least 1 day with ≥3 watery or unformed stools occurring ≥ 48 hours after hospital admission) in Motahari Burn Hospital, Tehran, Iran enrolled in this study. We compared patients with a stool sample positive for *C. difficile* toxin (A or B) or antigen by an immunoassay enzyme with patients with HAD diarrhea with a stool sample negative for *C. difficile.* Patients who were hospitalized with diarrhea were excluded.

Demographic characteristics, clinical presentation, and duration of disease were analyzed, along with baseline laboratory analyses including leukocyte and platelet count, and stool exam. Treatment regimens included oral metronidazole and in refractory cases combination of oral metrondazole and vancomycin. The study was approved by the ethical committee of the hospital.

Results are expressed as frequencies and percentages for categorical variables and compare with chi-square test, and as means for continuous variables and compare with the independent sample t-test. P-values < 0.05 were considered significant. Statistical analysis was performed using SPSS version 21.

RESULTS

Diarrhea developed in 37 patients out of 3200 admitted patients (120/10,000) with a mean burn size of 34.8 ±20.1%. Among them, 7 patients had a positive result for *C.difficile* toxin and antigen and 1 patient had only for toxin (21%). Demographic data are presented in Table 1. The patients' mean age was 38.6 ±14.8 (range, 18-75) years. A total of 26 (68.4%) patients were male, while all of the patients had surgical intervention (e.g.; fasciotomy, scarotomy). All patients had been previously treated with antibiotics in hospital settings. Three (7.9%) patients had diabetes, while none had gastrointestinal diseases. The mean time between antibiotic therapy and occurrence of diarrhea was 9.5 ± 6.2 days (range, 1-30), (10.8 ± 4.9 d in CDI versus 9.2 ± 6.6 d in HAD P= 0.5).

Fever, and abdominal cramps occurred in 23 (62.2%), and 10 (27%) patients, respectively. Only four patients (11.1%) had RBC in their stool exams, and fourteen patients (37.8%) had WBC in their stool exams; it was higher among patients with CDI than among patients suffering diarrhea without CDI (75% versus 27.6%, P=0.02). Nine (23.7%) patients died in the 7.8± 4.2 days, mostly due to co-morbidities (one patient died due to diarrhea). The mean duration of diarrhea was 3.6 ± 2 (1–8) days (4 ± 2.1 d in CDI versus 3.5 ± 2 d in HAD, P= 0.5).

Laboratory analyses, including WBC counts, hemoglobin, platelet count, albumin, blood sugar, and calcium are presented in Table 2. Twenty two (57.9%) patients were treated with oral metronidazol and eleven (28.9%) patients were treated with combination of metronidazole and vancomycin, higher rate of combination therapy was seen in CDI than HAD (P= 0.05).

There were no differences in patient age, gender, burn size, burn degree, or season. There were also no differences between the groups in temperature, abdominal cramp, albumin, hemoglobin, or platelet levels. The only significant findings that differed between the two types of diarrhea was the white blood cell count on the day of diagnosis (16928.5 ± 8328.8 versus 1190 ± 4976.7, P= 0.02) and the presence of leukocyte in stool exam (P= 0.02).

Table 1. Demographic data of patients with HAD

	CDI	HAD	Total	P. Value
Gender: Male	6 (75%)	20 (66.7%)	26 (68.4%)	0.5
Female	2 (25%)	10 (33.3%)	12 (31.6%)	
Age (mean ± SD) y	33.5 ± 9.2	40 ± 15.8	38.6 ± 14.8	0.2
Season: Spring	0	7 (23.3%)	7 (18.4%)	0.06
Summer	5 (62.5%)	12 (40%)	17 (44.7%)	
Fall	2 (25%)	1 (3.3%)	3 (7.9%)	
winter	1 (12.5%)	10 (33.3%)	11 (28.9%)	
Burn size (mean ± SD)	29.8 ± 20.4	36.1 ± 20.1	34.8 ±20.1	0.4
Burn type: Electrical	2	8	10	0.8
Gas explosion	2	8	10	
Fire	2	3	5	
Gasoline	1	3	4	
Scald	0	4	4	
others	1	3	4	
Fever (%)	7 (87.5)	16 (55.2)	23 (62.2)	0.1
Abdominal cramp (%)	2 (25)	8 (27.6)	10 (27)	0.6
Death (%)	1 (12.5)	8 (26.7)	9 (23.7)	0.3

CDI: C.Difficile Infection, HAD: Hospital-Acquired Diarrhea

Table 2. laboratory Data of patients with HAD

	CDI	HAD	Total	P. Value
WBC (mean ± SD) 10^3cell/µL	16.9 ± 8.3	11.1 ± 4.9	12.2 ± 6	0.02
Hg (mean ± SD) g/dl	10.9 ± 1.4	10.8 ±1.1	10.8 ± 1.2	0.7
Platelet (mean ± SD) 10^3/ µL	292.2 ± 55.8	310.4 ± 144.5	306.9 ± 131.9	0.7
Albumin (mean ± SD) g/dL	2.61 ± 0.4	2.8 ± 0.4	2.7 ± 0.4	0.3
Blood Sugar (mean ± SD)mg/dL	106.1 ± 20.3	103.9 ± 32.5	104.3 ± 30.3	0.8
Calcium (mean ± SD)mg/dL	6.9 ± 0.7	7.1 ± 1.1	7.1 ± 1	0.5
Stool Exam: WBC (%)	6 (75)	8 (27.6)	14 (37.8)	0.02
RBC (%)	1 (14.5)	3 (10.3)	4 (11.1)	0.7

CDI: C.Difficile Infection, HAD: Hospital-Acquired Diarrhea

DISCUSSION

HAD is a recognized cause of increased morbidity, mortality, hospital length of stay, and healthcare costs. Diarrhea also affects patient outcomes by limiting the use of necessary treatments such as antibiotics, enteral nutrition, immunosuppressants, and antineoplastics. Broad-spectrum antibiotics and antibiotics that achieve high concentrations within the intestinal lumen posed the greatest risk of antibiotic-associated diarrhea because they disrupt the intestinal flora to a greater degree. In such cases, antibiotic removal of bacteria that normally produce butyrate, a colonic epithelial cell nutrient, and break down undigested carbohydrates results in epithelial dysfunction and an increased osmotic load within the intestinal lumen, leading to diarrhea (4). HAD has many causes but *C. difficile* infection (CDI) is the most common cause of antibiotic associated diarrhea (1, 7).

This study design focuses on the differences between patients with CDI and non-CDI hospital diarrhea in a clinical setting. The incidence of HAD in our setting

was 12/1000 and 21% of them were CDI. The calculated incidence of HAD was from 2 to 41% in different investigation according to different study design and environment (1, 4, 5, 8). Acquisition of diarrhea occurred within 1-30 days of antibiotic exposure and 75% of them in the first 14 days, similarly as other surveys (2, 6, 9). According to preexisting severe burn condition of our patients, all of them had received antibiotic and underwent surgical procedure.

CDI usually causes watery diarrhea, sometimes with mucus (suggestive colitis), while bloody diarrhea is exceptional (6, 10). Similarly, we found only 14.5% bloody diarrhea however colitis was found in 75% of our patients that was more in CDI prevalent than HAD.

Fever, abdominal cramping, and peripheral leukocytosis are common in CDI (6, 10) but only peripheral leukocytosis was more prevalent in our study.

The laboratory analyses among our patients showed hypoalbominemia similar to other study (6). Low albumin level is a consequence of malabsorption that can be seen in diarrhea.

The mean duration of diarrhea in our patients was 3.6 days. It was shorter than other study like Korac and et al. (7.10 ± 4.88 d) (6). The burn patients are very critical patients and diarrhea adds to problems in patient care, disturbs fluid and electrolyte balance, and worsens nutritional status, so it should be diagnosed and treated promptly and aggressively as had be done in our setting.

Lv et al. observed no significant difference in demographics, age and gender, duration of hospitalization, clinical outcomes, albumin or WBC counts between two groups (CDI and HAD) (11), the same as our study except for peripheral leukocytosis that was seen in our CDI group.

The CDI mortality rate reported in a number of studies varies from 13%–27% (12, 13). Similarly, in our study the case-fatality rate for patients with CDI was 12.5% as compared to 26.7% for patients with HAD, and there was no significant difference. However, Zahar et al. found that ICU- and hospital crude mortality of CDI were 21 and 34%, respectively (14). Variability of the patient populations was their explanation of this difference.

In conclusion, we found no significant difference in demographics, age and gender, duration of diarrhea, clinical outcome, albumin, hemoglubin or platelet count between 2 groups. The only significant findings that differed between the two types of diarrhea was the white blood cell count on the day of diagnosis and the presence of leukocyte in stool exam. So patients with HAD, leukocytosis and colitis should be evaluated for CDI and prompt treatment of it.

REFERENCES

1. Lima AAM, Warren CA, Guerrant RL. Bacterial inflammatory enteritides. In: Bennet JE, Dolin R, Blaser M, editors. Principle and practice of infectious diseases, 8th ed, Philadelphia PA: Elsevier Saunders; 2015
2. Bhuiyan M U, Luby SP, Zaman RU, Rahman MW, Sharker MAY, Hossain MJ, et al. Incidence of and risk factors for hospital-acquired diarrhea in three tertiary care public hospitals in Bangladesh. *Am J Trop Med Hyg* 2014; 91: 165-172.
3. Yang BK, Do BJ, Kim EJ, Lee JU, Kim MH, Kang JG, et al. The simple predictors of pseudomembranous colitis in patients with hospital-acquired diarrhea: A prospective observational study. *Gut Liver* 2014; 8; 41-48.
4. Polage CR, Solnick JV, Cohen SH, Nosocomial diarrhea: evaluation and treatment of causes other than *Clostridium difficile. CID* 2012; 55: 982-989.
5. Crabtree SJ, Robertson JL, Chung KK, Renz EM, Wolf SE, Hospenthal DR, et al. *Clostridium difficile* infections in patients with severe burns. *Burns* 2011; 37: 42-48.
6. Korac M, Milosevic I, Markovic M, Popovic N, Ilic M, Markovic A, et al. *Clostridium difficile* infection: a Serbian single-center experience, *J Infect Dev Ctries* 2015; 9:136-140.
7. Khan FY, Elzouki AN, *Clostridium difficile* infection: a review of the literature. *Asian Pac J Trop Med* 2014; 7S1: S6-S13
8. Daneman N, Guttmann A, Wang X, Ma X, Gibson D, Stukel TA, The association of hospital prevention processes and patient risk factors with the risk of *Clostridium difficile* infection: a population-based cohort study. *BMG Qual Saf* 2015; 24:435-443.
9. Rotimi VO, Mokaddas EM, Jamal WY, Verghese TL, el-Din K, Junaid TA. Hospital-acquired *Clostridium difficile* infection amongst ICU and burn patients in Kuwait. *Med Princ Pract* 2002; 11:23-28.
10. Hookman P, Barkin JS, *Clostridium difficile* associated infection, diarrhea and colitis. *World J Gastroentrol* 2009; 15: 1554-1580.
11. Lv Z, Peng GL, SU JR, Factors associated with *Clostridium difficile* diarrhea in a hospital in Beijing, China. *Braz J Med Biol Res* 2014; 47: 1085-1090.
12. Kyne L, Hamel MB, Polavaram R, Kelly CP: Health care costs and mortality associated with nosocomial diarrhea due to *Clostridium difficile. Clin Infect Dis*

2002; 34:346-353.
13. Bishara J, Peled N, Pitlik S, Samra Z: Mortality of patients with antibiotic associated diarrhoea: the impact of *Clostridium difficile*. *J Hosp Infect* 2008, 68:308-314.
14. Zahar JR, Schwebel C, Adrie C, Garrouste-Orgeas M, Français A, Vesin A, et al. Outcome of ICU patients with *Clostridium difficile* infection. *Crit Care* 2012; 16:R215.